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(54) Suspension arm with flattened end part

(57) A suspension arm (1) intended to be used in an air-sprung wheel suspension system of a vehicle is substantially rectangular in cross section, has a first end part (2) which is designed to pivotably secure the suspension arm (1) to the chassis of a vehicle and has a second end part (3) which is integral with the remainder of the suspension arm (1) and is designed to mount an air-spring bellows on the suspension arm (1). The second end part (3) has a width which is greater than the width of the remainder of the suspension arm (1). It is preferable for the thickness of the second end part (3) to be substantially uniform and less than the thickness of the adjoining part (4) of the suspension arm, and this second end part (3) is formed by flattening.

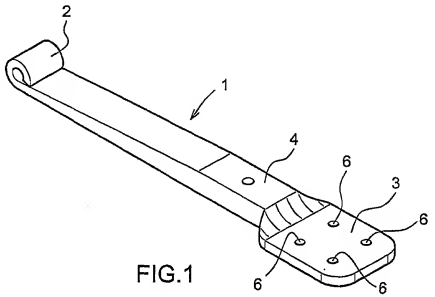

FIG.1

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Description

[0001] The invention relates to a suspension arm intended to be used in an air-sprung wheel suspension system of a vehicle, which suspension arm is substantially rectangular in cross section, has a first end part which is designed to pivotably secure the suspension arm to the chassis of a vehicle and has a second end part which is designed to mount an air-spring bellows on the suspension arm.

[0002] Suspension arms of this type are known. Known suspension arms are generally brought into the desired shape by rolling, in which case the thickness varies over the length of the suspension arm while the width is substantially constant. The first end part takes the form of a securing eyelet through which a securing bolt can fit. The first end part is formed by rolling the corresponding end part to the desired thickness and then bending it over to form a securing eyelet. The second end part is likewise brought to the desired thickness by rolling, which thickness gradually decreases towards the end of the suspension arm.

[0003] Nowadays, suspension arms are made narrower than has hitherto been the case, for example 70-75 mm instead of 100 mm, while at the same time the thickness is increased to produce the required bending strength. A narrower suspension arm leads to problems with assembly of the spring bellows, since only a relatively narrow mounting surface is available. This applies in particular in the situation in which the air-spring bellows needs to be mounted offset with respect to the longitudinal centre axis of the suspension arm, in view of the space available next to the tyres of the vehicle. These problems are solved by mounting a bellows carrier between the suspension arm and the air-spring bellows or by arranging a reinforcing plate in that section of the air-spring bellows which is connected to the suspension arm. In certain cases, the second end part of the suspension arm is also bent sideways, so that the suspension arm acquires approximately the shape of a hockey stick. However, these solutions incur additional costs.

[0004] It is an object of the invention to provide a suspension arm in which an air-spring bellows can be mounted on a relatively narrow suspension arm without the need for additional means on the suspension arm, even if the air-spring bellows needs to be mounted laterally offset with respect to the longitudinal centre axis of the suspension arm.

[0005] According to the invention, this object is achieved by a suspension arm according to claim 1.

[0006] Preferred embodiments of the suspension arm according to the invention are defined in the dependent claims.

[0007] The invention will be explained in more detail in the following description with reference to the drawing, in which:

Fig. 1 shows a perspective view of a specific embodiment of the suspension arm according to the invention,

Fig. 2 shows a plan view of the suspension arm from Fig. 1,

Fig. 3 shows a side view of the suspension arm from Fig. 1,

Fig. 4 shows a plan view of another embodiment of the suspension arm according to the invention,

Fig. 5 shows a plan view of yet another embodiment of the suspension arm according to the invention,

Fig. 6 shows a side view of a suspension arm according to the invention in a crank shape, and

Fig. 7 shows a plan view of yet another embodiment of the suspension arm according to the invention.

[0008] The suspension arm 1 according to the invention is intended to be used in an air-sprung wheel suspension system of a vehicle, as shown for example in EP-A-1273464.

[0009] The suspension arm 1 shown in Fig. 1 - 3 is substantially rectangular in cross section, preferably with rounded corners, and has a first end part 2, which is designed to pivotably secure the suspension arm 1 to the chassis of a vehicle, and a second end part 3, which is designed to mount an air-spring bellows on the suspension arm 1.

[0010] The first end part 2 is in the form of a securing eyelet through which a securing bolt can fit. In the embodiment shown, the first end part 2 is formed by rolling the corresponding end part to the desired thickness and then bending it over to form a securing eyelet.

[0011] The second end part 3 is integral with the remainder of the suspension arm 1. The second end part 3 has a width B which is greater than the width b of the remainder of the suspension arm 1 and has a substantially uniform thickness D which is less than the thickness d of the adjoining part 4 of the suspension arm 1. It is preferable for the width B to be at least 25% greater than the width b.

[0012] Designing the suspension arm 1 in this way allows an air-spring bellows to be mounted on the suspension arm 1 without the need for additional means with a relatively narrow width of the suspension arm 1 even if the air-spring bellows needs to be mounted laterally offset with respect to the longitudinal centre axis 5 of the suspension arm 1. Furthermore, holes 6 for securing an air-spring bellows may be arranged in the second end part 3, at right angles to the surface of the second end part 3. Arranging the second end part 3 so as to be asymmetric in the thickness direction of the suspension arm 1, as shown in Fig. 2, allows the same suspension arm to be used for various ride heights. It is easy to turn over

the suspension arm 1.

[0013] The second end part 3 is preferably formed by flattening. This contrasts with the conventional suspension arms, in which the second end part is formed by rolling.

[0014] Flattening has a number of advantages over rolling. Flattening allows the second end part 3 of the suspension arm 1 according to the invention to be formed in a relatively simple way. On account of the profile of the thickness of the second end part 3, which thickness is substantially uniform and smaller than the thickness of the adjoining part of the suspension arm 1, less material is required than with a rolled, obliquely tapering second end part, making the suspension arm more lightweight. Furthermore, in the case of a flattened end part 2, the amount of waste material (cutting waste) is considerably reduced compared to a rolled end part, or even there is no waste material whatsoever. Flattening produces convex side edges of the second end part, whereas with rolling there is a risk of the side edges of the second end part being concave, which has the drawback of high stresses in the outermost fibres.

[0015] Furthermore, flattening offers the option of providing the second end part 3 with one or more reinforcing ribs extending in the longitudinal direction of the suspension arm or of providing the second end part with a different shape, as shown in Fig. 4 and 5.

[0016] In the embodiment shown in Fig. 4, the second end part 13 of the suspension arm 11 is substantially V-shaped. In the embodiment shown in Fig. 5, the second end part 23 of the suspension arm 21 is provided with a hole 24.

[0017] Fig. 6 shows an embodiment of the suspension arm 31 according to the invention in a crank shape, the second end part 33 of this suspension arm likewise being formed by flattening. In this embodiment, the dimension L2 can be smaller than in the case of a comparable suspension arm in which the second (obliquely tapering) end part is formed by rolling.

[0018] In another possible embodiment of the suspension arm according to the invention, which is shown in Fig. 7, the first end part 42 of the suspension arm 41 with securing eyelet is also wider than the remainder of the suspension arm 41. This wider end part 42 is preferably formed by flattening the end part and then bending the flattened end part over to form a securing eyelet. The second end part 42 is, for example, of exactly the same width as relatively wide suspension arms which have been known hitherto. This has the advantage that the known wide suspension arms can easily be replaced by narrower suspension arms according to the invention without the securing point on the vehicle having to be adapted.

[0019] Another embodiment (not shown) of a suspension arm in which only the first end part of the suspension arm with securing eyelet is wider than the remainder of the suspension arm is also conceivable. In this case too, the end part is preferably formed by flattening and then bending it over to form a securing eyelet. The second end part may in this case be of the same width as the remainder of the suspension arm.

Claims

1. Suspension arm intended to be used in an air-sprung wheel suspension system of a vehicle, which suspension arm is substantially rectangular in cross section, has a first end part which is designed to pivotably secure the suspension arm to the chassis of a vehicle and has a second end part which is integral with the remainder of the suspension arm and is designed to mount an air-spring bellows on the suspension arm, **characterized in that** the second end part has a width which is greater than the width of the remainder of the suspension arm.

2. Suspension arm according to claim 1, in which the second end part has a substantially uniform thickness which is less than the thickness of the adjoining part of the suspension arm.

3. Suspension arm according to claim 1 or 2, in which the second end part is formed by flattening.

4. Suspension arm according to one of claims 1 - 3, in which the width of the second end part is at least 25% wider than the remainder of the suspension arm.

5. Suspension arm according to one or more of claims 1 - 3, in which the second end part is provided with one or more reinforcing ribs extending in the longitudinal direction of the suspension arm.

6. Suspension arm according to one of claims 1 - 3, in which the second end part is substantially V-shaped.

7. Suspension arm intended to be used in an air-sprung wheel suspension system of a vehicle, which suspension arm is substantially rectangular in cross section, has a first end part which is designed to pivotably secure the suspension arm to the chassis of a vehicle and has a second end part which is integral with the remainder of the suspension arm and is designed to mount an air-spring bellows on the suspension arm, **characterized in that** the first end part has a width which is greater than the width of the remainder of the suspension arm.

8. Suspension arm according to claim 7, in which the first end part is formed by flattening and then bending, in such a manner as to form a securing eyelet, the centre axis of which runs at right angles to the longitudinal direction of the suspension arm.

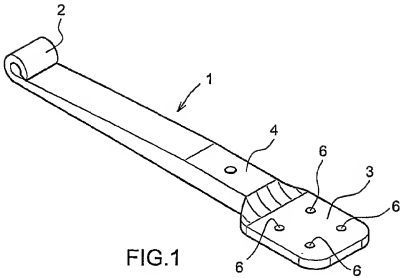

FIG.1

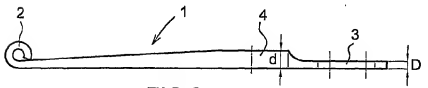

FIG.2

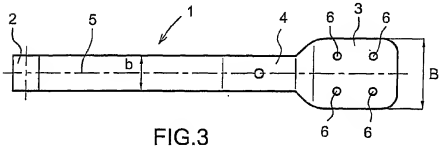

FIG.3

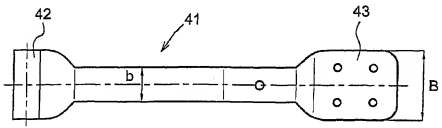

FIG.7

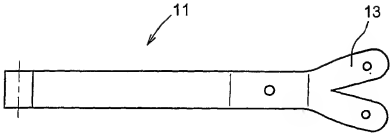

FIG.4

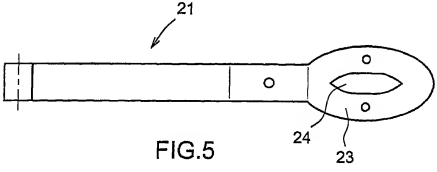

FIG.5

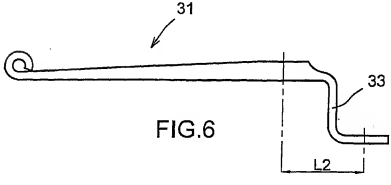

FIG.6

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EUROPEAN SEARCH REPORT

Application Number
EP 05 07 6954

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 340 165 B1 (KELDERMAN GARY L) 22 January 2002 (2002-01-22) * figure 2 *	1,2	B60G11/46 B60G11/28 B60G7/00 B60G9/00
X A	EP 1 145 878 A (BPW BERGISCHE ACHSEN KOMMANDITGESELLSCHAFT) 17 October 2001 (2001-10-17) * figures 5,6 *	1,6 5	
A	EP 1 138 432 A (TINSLEY BRIDGE LIMITED) 4 October 2001 (2001-10-04) * the whole document *	1,7	
A	PATENT ABSTRACTS OF JAPAN vol. 005, no. 098 (M-073), 12 June 1981 (1981-06-12) -& JP 56 036308 A (NHK SPRING CO LTD), 9 April 1981 (1981-04-09) * abstract; figures 2,3 *	1,7	
A	DE 42 24 965 C1 (BERGISCHE ACHSENFABRIK FR. KOTZ & SOEHNE, 5276 WIEHL, DE) 5 August 1993 (1993-08-05) * figures *	1,7	TECHNICAL FIELDS SEARCHED (IPC) B60G
A	DE 196 17 929 A1 (OTTO SAUER ACHSENFABRIK KEILBERG, 63856 BESSENBACH, DE) 11 December 1997 (1997-12-11) * figure 2 *		
A	EP 1 273 464 A (WEWELER NEDERLAND B.V) 8 January 2003 (2003-01-08) * figures *	1,7	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 November 2005	Tsitsilonis, L

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 083 (M-1216), 28 February 1992 (1992-02-28) & JP 03 268805 A (SUMITOMO METAL IND LTD), 29 November 1991 (1991-11-29) * abstract * -----		

TECHNICAL FIELDS SEARCHED (IPC)

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EPO FORM 1503 03.82 (P04C01)

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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25-11-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6340165 B1	22-01-2002	NONE	
EP 1145878 A	17-10-2001	DE 10018315 A1	25-10-2001
EP 1138432 A	04-10-2001	GB 2360496 A	26-09-2001
JP 56036308 A	09-04-1981	JP 1262229 C JP 59035701 B	25-04-1985 30-08-1984
DE 4224965 C1	05-08-1993	NONE	
DE 19617929 A1	11-12-1997	AT 218988 T EP 0806311 A2	15-06-2002 12-11-1997
EP 1273464 A	08-01-2003	NL 1018435 C2	13-01-2003
JP 03268805 A	29-11-1991	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82